Minutes of the Beam-beam Simulation Meeting, 11/02/05

Present: Joanne, Nikolay, Dejan, Yun, Thomas, Wolfram, Vladimir, Christoph

To start the discussion about which scenarios to simulate, Joanne presented last week's transparencies again (see last week's minutes). The main advantage of LIFETRAC over SIXTRAC is its capability to handle large numbers of particles, while SIXTRAC is limited to 64 particles only. Therefore, it can be sused to study the evolution of an entire distribution, while SIXTRAC would require an additional script to restart the program many times and therefore artificially increase the number of particles tracked. As of now it is still not clear what kind of noise LIFETRAC is capable of simulating – random tune modulations, beam-beam offsets, etc. Joanne will check this and report next week.

During the second part of the meeting an attempt was made to define a set of problems that should be studied using LIFETRAC. Wolfram mentioned that the predictive power of beam-beam simulations in hadron machines has always been quite poor; in general, simulations had to catch up with experiments instead. He therefore questioned that LIFETRAC has actually predicted anything at the TEVATRON, where it has been used in the past. He sees the main usefulness of the code in scanning various parameters in order to investigate the sensitive of beam-beam induced emittance growth to these conditions.
Vladimir suggested a couple of studies, namely benchmarking LIFETRAC and UAL, investigation of the beam-beam effect with double-gaussian beams, and simulation of eRHIC, where the electron beam is treated as the strong beam. The latter should compare dedicated eRHIC running with a parallel mode, having additional ion-ion collisions.
Another interesting simulation study was already suggested by Waldo last week. This study aims at comparing the effect of different methods of bringing beams into collision, namely longitudinally (cogging) versus transversely (removing separation bumps). LIFETRAC cannot remove transverse beam-beam separations gradually; instead, this will be modelled by studying the effect of different beam-beam offsets.
Thomas suggested to first start with a linear lattice for these studies, since the nonlinearity of the machine should be dominated by the beam-beam effect. He suspects that a beam size mismatch in conjunction with modulated 10 Hz beam-beam offsets may explain luminosity performance of RHIC. In this model, one of the beams (typically Yellow) gets blown up on the ramp, for example due to an instability. When beams are brought into collision, this initial beam size mismatch growth rapidly, leading to fast luminosity degradation. A simulation of this effect should also be attempted.